MDL Newsletter
Summer 2010

(For feedback or more information, please contact the AskMDL customer service group at **nws.askmdl@noaa.gov)**

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LAMP Updates and Gridded LAMP Progress – Dave Rudack

The LAMP Team has been busy working on a number of exciting projects. During the fall of 2010 we will be experimentally generating hourly gridded LAMP forecasts (out to 25 hours) for select weather elements at 2.5-km on the NDFD CONUS grid. These gridded weather elements include: 2-m surface temperature, 2-m dewpoint, continuous and probabilistic ceiling height and visibility forecasts. The latter two elements are especially important as they will be used as guidance to support the production of the NextGen 4-D weather data cube to support the aviation community. The LAMP team is concurrently developing hourly high resolution analyses of observations for the same four elements on the CONUS 2.5-km grid. These products will be first available to NWS forecasters via mdlnet (local server) in the fall of 2010 and available later in experimental NDGD. Later in 2011, we are planning to generate additional gridded weather elements at an hourly resolution that include analyses and forecasts of winds and forecasts of the probability of precipitation occurrence.

Another major effort that the LAMP team is involved with centers on the redevelopment of the station-based probabilistic and best category forecasts of ceiling height and sky cover. This refresh is necessary to keep current with the recent GFS MOS redevelopment and to be consistent with the NWS definition of sky cover. Verification results on independent data show an overall improvement in both ceiling height and sky cover forecasts with the most notable improvement occurring for projections 1-4 for sky cover. It is anticipated that this product will be available operationally later in 2011.

This year, LAMP has formed a team to address the ever growing concern that station-based weather forecasts remain meteorologically consistent with each other. For example, if LAMP were to forecast a ceiling height of say 200-400 feet, it would be meteorologically inconsistent if the sky cover forecast would to be clear, few, or scattered. The sky cover forecast must either be “broken” or “overcast.” Solutions to these types of inconsistencies along with temporal forecast inconsistencies (e.g., a highly variable 3-hour visibility forecast trace that fluctuates between less than ½ mile and greater than 6 miles) are currently being devised to improve consistency while not compromising the accuracy of LAMP forecasts. We believe that modifying these inconsistent forecasts will (1) better serve those customers who chose to use LAMP for preparing automated products such as TAFs and (2) improve the consistency across all gridded forecast elements both spatially and temporally. We are planning to address all station-based inter-element and temporal inconsistencies and have a post-processing system running experimentally by the latter half of 2011.

Developers of LAMP thunderstorm products are modifying the LAMP predictand to include radar returns of VIP level three or greater, even when there is no cloud-to-ground lightning. This more general definition of convection is being adopted to (1) forecast convective hazards that pose a risk to the aviation community (2) ensure that the convective probabilistic forecast values do not rapidly diminish after the influence of the observations wane. To facilitate the latter objective, the MOS Group is developing a convective predictor inline that uses LAMP's new convection definition. Over the next several months, a prototype will be developed for two LAMP cycles and verified. If all goes well, we will replace the current LAMP thunderstorm guidance for all 24 cycles. A timetable has not yet been set for this milestone.

GFS MOS Refresh and Gridded MOS Updates – Mark Antolik

MDL's Statistical Modeling Branch implemented a complete "refresh" of the GFS MOS system this past spring (on March 3, 2010). This consisted of developing new, updated forecast equations for all weather elements previously in the system, as well as the addition of new precipitation type and snowfall guidance to the 1200 UTC extended-range (MEX) messages. Also, since the new extended-range guidance for both the 0000 UTC and 1200 UTC cycle times was developed together, the dependent data samples used to generate equations for both packages are now consistent for the first time. In addition, we have added guidance for approximately 100 new METAR observing sites and for about 350 new marine locations. These additional sites will help to increase the resolution of the forecasts used for input to the GFS gridded MOS (GMOS) guidance as well as to bolster our support for NWS TAF requirements. More details about the GFS MOS refresh can be found on our changes page at: http://www.weather.gov/mdl/synop/changes.php .

The GFS MOS refresh is part of the Branch's ongoing efforts to respond to possible changes in the characteristics and performance of the MOS guidance as NCEP continues to implement newer versions of the operational NWP models. For example, we ran our latest GFS MOS system in parallel with output from a proposed new version of the GFS (with increased resolution and upgraded physics) prior to its implementation. This GFS upgrade was implemented by NCEP on July 28, 2010. Running the MOS system in this way can help us to anticipate potential impacts on the operational guidance. In this case, preliminary indications from NCEP were that a warm bias has been introduced into the GFS 2-m temperature fields, and the MDL parallel MOS runs suggest that at least some of this bias may be present in the MOS guidance. As a result, NCEP modelers will be working to implement a fix within the next few months. Future studies to examine how the upcoming implementation of the NMM-b is likely to affect the performance of the NAM MOS system also are planned.

Work to upgrade and expand the Branch's gridded MOS guidance continues as well. We constantly are investigating new sources of high-density surface observations, with an eye toward substantially increasing the number of mesonet sites available to the GMOS analysis. Assuming that these high-density data are of sufficient quality, we eventually hope to increase the number of stations used in the GMOS analysis to nearly 20,000. We also are in the process of developing the first-ever gridded MOS forecasts for Hawaii. Developers have completed the Hawaii land/water mask and are actively experimenting with first-guess fields. We are scheduled to have operational products available to the field this fall.

Finally, the Statistical Modeling Branch has been successful in recent weeks in developing prototype Gridded MOS output at 2.5 km resolution over the CONUS. Forecast grids are available in GRIB2 format for all current operational elements. The prototype 2.5-km GRIB2 files and images may be downloaded at:
http://www.mdl.nws.noaa.gov/~mos/gmos/conus25/index.php . The 2.5-km grids should exhibit a bit more detail (than the operational 5-km grids) in the forecasts of weather elements which are more heavily influenced by terrain. These would include temperature, dewpoint, max/min temperatures, relative humidity, winds, and snowfall. Less influenced by the resolution increase are POP and QPF grids, sky cover, and thunderstorms. As always, we encourage forecasters to feel free to take a look at these images and contact us with your comments. We welcome your input; it helps us to arrive at the most useful guidance products possible.

Autonowcaster Field Testing – Mike Churma

This past spring, MDL's Decision Assistance Branch conducted five weeks of intensive field testing of the Autonowcaster at the Dallas-Fort Worth Weather Forecast office.
The Autonowcaster is a short-term convection forecast system, developed by the National Center for Atmospheric Research (NCAR). The Autonowcaster ingests data from multiple sources (e.g., satellites, WSR-88D radars, surface observations, numerical models), and uses fuzzy-logic techniques to generate 0-1 hour deterministic forecasts of thunderstorm initiation, growth, and decay. This information could prove to be invaluable to NWS WFO forecasters, the Center Weather Service Units (CWSU's) and the aviation community in general. MDL has worked with the Dallas-Fort Worth Weather Forecast Office (WFO-FWD) and NCAR since 2005 to demonstrate and test the ANC system. MDL developed an ANC interface within the Advanced Weather Interactive Processing system (AWIPS) to display ANC's forecast products.

Key to the success of the Autonowcaster system is the placement of surface boundaries. While there are automatic algorithms to detect surface boundaries, testing at WFO-FWD has focused on the potentially higher-quality "human in the loop" paradigm, with meteorologists identifying and outlining surface boundaries in the D-2D display. These boundaries are sent instantly to ANC via the Local Data Acquisition and Dissemination (LDAD) system and ingested by ANC algorithms running on MDL computers in Silver Spring, MD. The ANC forecast products are then delivered back to the WFO in real time via the Local Data Manager (LDM).

In April and early May, visiting meteorologists from MDL, the NWS Aviation Services Branch, and the Melbourne, FL Weather Forecast Office worked weekly shifts at WFO-FWD. The visiting meteorologists were dedicated to Autonowcaster tasks. These tasks included: 1) drawing boundaries and setting them in motion in the AWIPS Display-in Two Dimensions (D-2D) display, 2) "nudging" the final results in an appropriate direction, if the resultant convection fields were overestimating or underestimating convection, and 3) closely watching the 0-1 hour Autonowcaster initiation, growth, and decay forecasts within D-2D. While all workstations at WFO-FWD can be used to generate boundaries or display Autonowcaster forecast fields, an additional AWIPS workstation was set up for the visiting meteorologists, and located next to the aviation workstation, to facilitate communication with FWD aviation meteorologists. Dallas-Fort Worth forecasters were consistently engaged and helpful, quality-controlling the boundaries and keeping the visitors informed of the developing forecast.

Results were transmitted to NOAA's Global Systems Division for evaluation. “With this experiment, we hope to determine whether forecaster-drawn surface boundaries improve the performance of the ANC algorithms,” said MDL team lead Mamoudou Ba. “The visiting meteorologists also were instrumental in identifying and helping to fix bugs in the system.”

MDL has also recently partnered with the Melbourne, Florida Weather Forecast Office to run the Autonowcaster at that WFO and has Autonowcaster algorithms running for the WFO-MLB area on MDL computers.

For more information on the Autonowcaster, please see, “The NCAR Auto-Nowcast System”, C. Mueller, et .al., Weather and Forecasting , v. 18, pp 545-561, 2003.
MDL’s Autonowcaster project can be followed at http://www.weather.gov/mdl/autonowcaster/)